Introduction

The need for separations as a means for performing the isolation, purification or analysis of substances, at scales ranging from tonnage quantities down to picograms or less, is an important feature of modern life. Such separations underpin virtually all aspects of research and commerce and indeed a vast industry has arisen to provide the equipment and instrumentation to perform and control these essential processes; indeed it is impossible to envisage our world without ready access to separations. To provide these capabilities a whole family of techniques has evolved to exploit differences in the physical or chemical properties of the compounds of interest, and to accommodate the scales on which the separations are performed. After all, a separation that works on the picogram scale based perhaps on capillary electrophoresis, may not easily be transferred to the gram scale and will be utterly impossible on the kilogram scale. In such instances an alternative type of separation, based on a totally different principle must be sought. And therein lies the problem–most scientists are specialists and while having an excellent knowledge of their own, often narrow, sphere of expertise are generally possessed of a much more hazy view of the capabilities and attributes of techniques outside that area. Even worse, such ignorance may persuade them to adopt an approach that is quite unsuited to the solution of the problem in hand.

The large number of articles in this encyclopedia, and the wide variety of the subject matter described in them, represents an attempt to provide separation scientists with a single authoritative source covering the broad range of separation methods currently available. Inevitably there is some overlap in places between articles dealing with closely related topics. However, in a work such as this where each article is meant to be a self-contained source of information, some overlap is unavoidable and not wholly undesirable in the context of ensuring full coverage of a topic.

The articles in the *Encyclopedia of Separation Science* fall into three categories as follows: 'Level I', which provides overviews of a particular separation area, e.g. flotation, distillation, crystallization, etc., written by acknowledged experts in the particular fields. These articles are presented with the aim of providing a wide ranging introduction to the topic from which the reader can then, if it seems appropriate, move on to 'Level II' articles.

DropBooks

Level II articles cover the theory, development, instrumentation and practice of the various techniques contained within each broad classification. For example the Level I article on chromatography is supported in Level II by descriptions of gas, liquid and supercritical fluid chromatography, together with information on instrumentation. Separations are, however, often of interest to practitioners because of their applications and Level II serves as an introduction to 'Level III'.

Level III provides detailed descriptions of the use of the various methods described in Levels I and II for solving real problems. These might include articles on the various methods for extraction of pesticides or drugs from a matrix, with other articles on the chromatographic or electrophoretic techniques that could be used for their subsequent analysis. The extensive cross-referencing and exhaustive indexing for all of the articles in the work should enable the reader to obtain easily and rapidly all the relevant information in the encyclopedia. In addition, each article at whatever level contains a brief but carefully selected bibliography of key books, review articles and important papers. In this way the encyclopedia provides the reader with an invaluable 'gateway' into the separation science literature on a topic.

Lastly, because the importance of separation science lies in its value as an applied technique, we have commissioned a number of 'essential guides' to method development, in a limited number of key areas such as the isolation and purification of proteins and enzymes, etc., or the development of chromatographic separations.

While the techniques described in these volumes can in many cases be used as the basis of analytical methods, the emphasis of this work is on the methods of separation of mixtures, rather than their determination. For a treatise devoted to Analytical Science the reader is referred to the *Encyclopedia of Analytical Science*, also published by Academic Press, which can be considered to be complementary to the present work, in that it deals in depth with analysis rather than the application of separations.

The reader faced with the need to perform a separation, requiring information on a type of detector, or the use of a technique for a particular class of compound, etc., should therefore be able to look into the encyclopedia for information on that topic. Even where there is no information that is directly relevant to

the problem, it should still be possible to begin at Level I in order to determine the potential of a technique to solve the problem and then progress down through the levels until a solution begins to emerge.

The editors believe that, taken as a whole, this encyclopedia and its electronic version should provide a valuable source of knowledge and expertise for both those already skilled in the art of some aspect of separations and also for the novice. That, at least, is our hope.

This encyclopedia is a guide providing general information concerning its subject matter; it is not a procedure manual. The readers should consult current procedural manuals for state-of-the-art instructions and applicable government safety regulations. The publisher and the authors do not accept responsibility for any misuse of this encyclopedia, including its use as a procedural manual or as a source of specific instructions.